Name(s) of Risk Team Members: R. Karol, D. Beavis	Point Value → Parameter ↓	1	2	3	4	5
Area/Facility Description Title: Collider-Accelerator Area/Facility # (if applicable): Area-Wide FRA 15-05	Occupancy or Use (A)	≤once/year	≤once/month	≤once/week	≤once/shift	>once/shift
Area/Facility Description: Brahms Area-Wide	Severity (B)	First Aid Only	Medical Treatment	Lost Time	Partial Disability	Death or Permanent Disability
Approved by: *E. Lessard* Date: 4/27/05 Rev.#: 0	Likelihood (C)	Extremely Unlikely	Unlikely	Possible	Probable	Multiple

Reason for Revision (if applicable):	Comments:

			Risk with Controls in Place					Risk with Additional Controls in Place				
Physical Item or Activity	Hazard(s)	Control(s)	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	Control(s) Added to Reduce Risk	**Occupancy A**	**Severity B**	**Likelihood C**	**Risk* AxBxC**	% Risk Reduction
Primary Beam	High hazard ionizing radiation	ACS; PASS; postings; crash buttons and chords; C-AD area classification; shielding; dosimeters; training; RSC reviews	1	5	1	5						
General Area Radiation, Residual Radiation, External Radiation	Ionizing radiation	Postings, training, shielding, RCD surveys, RCD oversight, RWP, work planning	4	1	1	4						
Electrical Equipment & Power Supplies BNL Class A & B <250 VAC; <1000Vdc	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working on or near permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; barriers; work planning; GFCI; grounding standards; emergency procedures	5	4	2	40	See Notes 1 through 4	5	3	2	30	25%
Electrical Equipment & Power Supplies BNL Class C <600 VAC; <6000 VDC	Arc blast; burn	Procedures, postings, training, PPE	3	5	2	30	See Notes 1 through 4	3	4	2	24	20%
Electrical Disconnects And Switches	Arc blast; burn	Procedures, postings, training, PPE	2	4	3	24	See Notes 1 through 4	2	4	2	16	33%

Electrical Disconnects And Switches	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working on or near permits; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; GFCI; grounding standards; emergency procedures; two-person rule for hot work	2	5	4	40	See Notes 1 through 4	2	5	3	30	25%
Motor Control Centers; Panels And Wall Sockets	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working on or near permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards	4	5	2	40	See Notes 1 through 4	4	4	2	32	20%
Motor Control Centers; Panels And Wall Sockets	Arc blast; burn	PPE; postings; training; procedures	4	4	2	32	See Notes 1 through 4	4	3	2	24	33%
Electrical Powered Hand Tools	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; procedures; training; labeling; work planning; GFCI; grounding standards; double insulation	4	3	3	36	See Notes 1 through 4	4	3	2	24	33%
Extension Chords; Temporary Wiring And Power Strips	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; qualified electricians and technicians; GFCI; grounding standards	4	3	3	36	See Notes 1 through 4	4	3	2	24	33%
Vacuum	Ear damage	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; use of industry standards; design reviews	3	4	1	12						
Vacuum	Being struck by an object such as flying debris	Postings; PPE; maintenance; training; work planning; ASSRC reviews; procedures; Tier 1 inspections; Chief ME reviews; vacuum windows covered during handling; ; use of industry standards; design reviews	3	4	1	12						
Magnetic Field	Adverse mechanical force exerted on ferromagnetic objects and or to electronic/medical implants.	Barriers; warning systems; postings; training; ESRC review; work planning; procedures; Tier 1 inspections; magnetic safety reviews; medical exams	1	4	2	8						

Flammable /Explosive Gases	Fire, Smoke and Heat	Fire detection & suppression systems; procedures; training; equipment protective systems; ASSRC/ESRC reviews; Fire Hazards Analysis; Tier 1 inspections; maintenance; emergency procedures; BNL Fire Rescue; ASE requirements; volume controls; segregation controls; labeling; area posting; gas detection interlock systems	4	4	2	32						
Lighting	Being struck against an object, such as a carpenter walking into a door frame due to poor lighting	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	2	3	18						
Lighting	Falls on same level	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	3	3	3	27						
Lighting	Being struck by an object due to a material handling mishaps	Tier 1 inspections; maintenance; emergency lighting; temporary lighting	2	3	3	18						
Material Handling	Being struck by an object due to improperly secured material or loss of control	Work planning; equipment specific training; work area barricades and controls; PPE; clamps; straps; vices; fixtures	3	3	3	27						
Chemical Handling	Eye exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	4	2	24						
Chemicals	Inhalation exposure	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	3	1	9						
Chemicals	Fire; explosions	Procedures; compliance with regulations; training; CMS inventory; MSDS; volume controls; PPE as required; locked or controlled areas; postings; labeling; proper containers; segregation; proper spill cleanup equipment available; Tier 1 inspections	3	2	1	12						
Manual Material Handling	Bodily reaction – injuries resulting from bending, climbing, loss of balance and slipping without falling	Gloves; hardhat; handcarts; dollies; training; safety shoes	4	3	3	36						
Remotely Operated Equipment	Becoming caught in or compressed by equipment	Postings; barriers; guards; maintenance; training; work planning; procedures; Tier 1 inspections; ASSRC reviews	2	4	3	24						
Use Of Hand Tools	Being struck by an object, such as flying chips	PPE; training; maintenance; Tier 1 inspections; UL listed equipment; pre-inspections	4	2	3	24						

Use Of Hand Tools	Being struck against an object, such as a sharp surface	PPE; training; guarding	4	2	3	24							
Use Of Hand Tools	Becoming caught in or compressed by equipment	Equipment specific training; guarding; PPE; postings	4	2	3	24							
Walking – Working Surfaces	Falls on same level	PPE; Tier 1 inspections; work planning; P.E. scheduled maintenance; internal and external audits; posting; labeling; training; barriers; communication; lessons learned; C-A staff was asked to identify outside walking/working surfaces that are in need of repair. PE instituted a program to correct deficiencies. Snow shovels and salt were distributed to staff and users for emergency use on walkways in winter storms; safety checklist for Walking and Working Surfaces	5	3	3	45							
Work At Heights	Falls to lower level, such as falling from a ladder or over a railing	Postings; barriers; fall protection; maintenance; training; work planning; procedures; Tier 1 inspections; PPE; approved scaffolding and platforms; approved ladders; anti-slip surfaces	2	5	3	30							
Working Environment	Poor air quality; mold	HVAC; facility maintenance; Tier 1 inspections	5	2	1	10							
Water	Being struck by an object due to a pressure release	Postings; maintenance; PPE; training; work planning; ASSRC review; procedures; Tier 1 inspections; PLC monitoring and interlocks	4	1	3	12							
Water	Contact with temperature – extremes that result in such injuries as heat exhaustion, frost bite or burns	Postings; maintenance; PPE; training; work planning; ASSRC review; procedures; Tier 1 inspections	4	3	2	24							
Tours	Internal or external radiation	Postings; trained escorts; RCD concurrence to enter radiation areas; RWP; work planning; training waiver; red TLD; BNL minors policy	3	1	1	3							
Transformer And Switch Yards	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; installations comply with applicable codes; procedures; training; LOTO; qualified electricians; postings; locked areas; work planning; grounding standards; emergency procedures; grounding before work start	2	5	2	20	See Notes 1 through 4	2	4	2	16	20%	
Transformer And Switch Yards	Arc blast	PPE; procedures; training; qualified electricians	2	5	2	20	See Notes 1 through 4	2	4	2	16	20%	
Standby Generators	Shock or electrocution	All equipment is listed or reviewed by CEE; Tier 1 inspections; disconnected cable policy; installations comply with applicable codes; procedures; training; distribution drawings; LOTO; Kirk keys; working on or near permits; ASSRC/ESRC reviews; qualified electricians and technicians; cabinet interlocks; postings; locked areas; guarding; work planning; grounding standards; emergency procedures	2	5	2	20	See Notes 1 through 4	2	4	2	16	20%	

Standby Generators	Noise	Hearing protection	2	4	1	8							
Radioactive Sources	Internal or external radiation	Training; BNL and C-AD source custodians; source inventory; shielding; locked boxes; leak checks; posting; dosimeters; Chipmunk calibration procedures; locked cage for Chipmunk source	2	1	1	2							
Pressurized Systems	Being struck by an object due to a pressure release	Postings; PPE; maintenance; training; work planning; ESRC reviews; procedures; interlock systems; certification/testing of pressure related equipment; Tier 1 inspections; LOTO; C-AD Chief ME reviews; codes and standards usage	2	2	2	8							
Noise	Hearing loss	Training; hearing protection; noise surveys; procedures; postings; medicals; engineered noise reduction; work planning; locked areas with limited access to authorized personnel only	2	4	2	16							
Egress	Impaired egress	Tier 1; work planning; skill of craft; P.E. scheduled maintenance; internal and external audits; posting; labeling; training; barriers; communication; internal processes; lessons learned; life safety codes; emergency preparedness	5	3	3	45							
Cryogenic	Being struck by an object due to a pressure release	Postings; maintenance; training; work planning; LOTO; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; interlock systems; Tier one inspection; pressure testing	4	2	2	16							
Cryogenic	Contact with temperature – extremes that result in such injuries as frost bite or burns	Postings; maintenance; training; work planning; LOTO; Cryogenic Safety Committee /ASSRC reviews; procedures; PPE; interlock systems; Tier 1 inspection	4	3	2	24							
Cryogenic Systems	Oxygen deficiency	ODH analysis; ODH exhaust fans; training; remote/local audible/visible alarms; Fire/Rescue group response; Cryo-systems designed to consensus codes; procedures; work planning; LOTO; inspections; PPE as required; postings and labeling; Cryogenics Safety Committee/ASSRC reviews.	1	3	2	6							
Computer And Office Machine Usage	Repetitive motion resulting in muscular-skeletal injury	BNL SHSD ergonomic reviews; training; use of ergonomically designed equipment	5	3	2	30							
Batteries/UPS	Molten spray	PPE; procedures; training	4	2	1	8							
Limited Access Areas	Impaired egress	Tier 1; work planning; skill of craft; training; barriers;	2	1	3	6							
Chemical	Beryllium exposure	Postings, training, PPE, work planning, BURF	3	2	1	6							

Further Description of Controls Added to Reduce Risk: NOTE 1: OSHA Teams visited C-AD during the period October 20 through October 31, 2003 and recorded electrical non-compliances. All OSHA findings will be closed by 2006 by full compliance or with an equivalent level of safety.. The status of the OSHA items are maintained in BNL's Compliance suite, and closed on a schedule commensurate with funding. NOTE 2: A compliance plan to have all electrical installations accepted by an Authority Having Jurisdiction (AHJ), as per 29CFR1910 Subpart S, has been implemented by BNL. UL, CSA, LLC or other NRTL accepted equipment will be acquired at BNL for all future installations. Prior installations shall be reviewed and accepted by qualified AHJs. The plan must be completed by 2009. NOTE 3: Full compliance with NFPA 70E was adopted by the C-AD in December 2005. NFPA 70E prescribes protective clothing to protect against shock and arc blast; thus reducing the severity and likelihood of an injury. It also prescribes training, which is currently fulfilled by taking the 2005 version of Electrical Safety 1 and by attending the C-AD 3-hour classroom course on electrical safety rules and PPE. NOTE 4: Contractor and vendor training in work planning and electrical safety has been improved. Plans to reach all contractors and vendors with regard to NFPA 70E requirements prior to performing work at BNL have been implemented. C-AD has obtained lists of all its vendors and suppliers and is ensuring that they take Electrical Safety 1 or have equivalent training if needed.					
*Risk:	0 to 20	21 to 40	41-60	61 to 80	81 or greater
	Negligible	Acceptable	Moderate	Substantial	Intolerable